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## DEVELOPING MATHEMATICS WORKSHEET USING FUTSAL CONTEXT FOR SCHOOL LITERACY MOVEMENT

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### Abstract

School Literacy Movement, one of the government's efforts to optimize the ability of students in terms of literacy, needs support from every circle; one of them is from researches in the educational field. This research aims to develop reading texts in a futsal context that will be presented in students' worksheet with valid and practical criteria that will have a potential effect in mathematics learning. This research is using the design research method with a development studies type that consists of three main steps, such as preliminary, prototyping, and assessment with an evaluation plot formative study that used in a prototyping step, including the self-evaluation, expert review and one-to-one, small group, and field test. The research subjects are the students in 7<sup>th</sup> grade in one of Junior High School in Karawang. There are some steps taken in the data collection process, such as documentation, walkthrough, questionnaire, test, and interview. According to the data analysis, it can be concluded that this research has been producing a product in the form of thirteen reading the text for School Literacy Movement invalid and practical mathematics learning that will have a potential effect for the students' learning result in the mathematics learning process.

**Keyword:** School Literacy Movements, Futsal, Mathematics Learning

### Abstrak

Gerakan literasi sekolah sebagai upaya pemerintah untuk mengoptimalkan kemampuan peserta didik dalam hal literasi membutuhkan dukungan dari berbagai kalangan, salah satunya peneliti dibidang pendidikan. Tujuan dari penelitian ini adalah mengembangkan teks bacaan dengan konteks futsal yang disajikan pada LAS dengan kriteria valid, dan praktis, serta memiliki efek potensial pada pembelajaran matematika. Penelitian ini menggunakan metode *design research* jenis *development studies* yang terdiri atas tiga langkah utama yaitu *preliminary*, *prototyping*, dan *assessment* dengan alur evaluasi yang digunakan pada tahap *prototyping* adalah *formative study*, meliputi tahap *self-evaluation*, *expert review* dan *one-to-one*, *small group*, serta *field test*. Subjek penelitian adalah siswa kelas VII di salahsatu SMP Karawang. Pengumpulan data dilakukan dengan cara dokumentasi, walkthrough, angket, tes, dan wawancara. Berdasarkan hasil analisis data, dapat disimpulkan bahwa penelitian ini telah menghasilkan produk berupa teks bacaan sebanyak 13 teks untuk gerakan literasi sekolah dalam pembelajaran matematika yang valid, dan praktis serta memiliki efek potensial terhadap hasil belajar peserta didik dalam pembelajaran matematika.

**Kata kunci:** Gerakan Literasi Sekolah, Futsal, Pembelajaran Matematika

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Indonesia has been one of the countries that take action in some international comparative study with an unsatisfied result; one of the examples is the result of the Programme for International Student Assessment (PISA). According to the result of Programme for International Student Assessment (PISA), the average value for Indonesia is still in a low number, compared to the average value of Organization for Economic Cooperation and Development (OECD). The average value was taken from three competitions; science, mathematics, and reading contest. OECD (2015) states that the average value in science is 493. However, Indonesia just got 403, in mathematics, the average value is 490,

while Indonesia only got 386, and the last average value is from reading, which is 493, while Indonesia only got 397. This data became one of the reasons why the Indonesian Government organize School Literacy Movement to synergize all of the potentials and expand the public role to grow, develop, and civilize literacy in Indonesia (Atmazaki, *et al.* 2017). School Literacy Movement is a movement to grow students' character through a civilization of school literacy ecosystem so that they will learn every day (Wiedarti, *et al.* 2016). This activity took 15 minutes to read and consists of three steps, such as habituation, development, and learning step (Kemendikbud, 2015).

The habituation stage of School Literacy Movement has been carried out, starting with students reading their books or the books that they borrow from the library. The reading books are depended on students' favorite such as novels or other non-lesson books. After reading, the students are asked to make a synopsis or retell the text they read. This habituation stage aims to increase love to read outside of school hours, improve reading comprehension, increase self-confidence as a good reader, and develop the use of various reading sources (Retnaningdyah, 2016). Although the habituation stage has been carried out, the development and learning stages have not been implemented due to the difficulty of obtaining non-lesson reading texts related to mathematical material, even though the development stage of School Literacy Movement can help students develop their ability to see the connection of reading material to mathematical material. One of the purposes of the development stage is that students can find the connection between books that they read and their surroundings (Retnaningdyah, 2016). Thus, at the learning stage, students have been able to show the connection of reading texts in the students' worksheet of School Literacy Movement, so the reading text becomes the starting point for learning mathematical material. Through the learning stage of School Literacy Movement, students can understand the text and relate it to personal experience, so the lifelong learners are formed, develop critical thinking skills, process and manage communication skills creatively through responding to textbooks and lesson books (Retnaningdyah, 2016).

School Literacy Movement is expected to develop the ability of students to use the reading results for their life skills rather than just being able to read and write. Therefore, literacy in reading and writing becomes important so that it becomes one of the needs that must be fulfilled and has relevance to the daily lives of students. Mathematical literacy is strongly influenced by realistic mathematics education (RME) because it emphasizes the importance of solving mathematical problems in real-life so that they can be used as a basic theory to develop mathematics-based literacy learning (Zulkardi & Kohar, 2018; Putri & Zulkardi, 2019). The discourse of mathematics concerning its connection with everyday practice (Solomon, 2009; Prahmana & Suwasti, 2014). In the matter of mathematics as a subject that is closely related to the daily lives of students, it is necessary to have a familiar context in their daily lives that is related to mathematical content learned by students so it can be a connector to understand mathematical concepts formally. The context in learning mathematics is offering abstract mathematical concepts that are more easily understood by the students (Fajriyah, Putri, & Zulkardi, 2017; Risdiyanti & Prahmana, 2018; Hendroanto, *et al.* 2018).

Mathematics learning will be more meaningful, interesting, and fun by using the context of sports in the process of learning (Yansen, Putri, & Zulkardi, 2018). Sport is one of the activities that are enjoyed by students, and they usually do this activity at least once a week at school. Sport is a physical activity to maintain health and strengthen the muscles, and in it can be considered as an entertaining, enjoyable activity to improve achievement (Muchlisa, 2017). Things related to sports have become the context used for the starting point in learning mathematics, including the context of sprint on ASEAN games that can help students understand fraction material (Roni, Zulkardi, & Putri, 2017), also, the swimming context can stimulate informal knowledge of students about the meaning of fractions (Putri, Gunawan, & Zulkardi, 2018). Students who learn to use the context of sports will feel that mathematics is more fun because it is different from the repeated math practice questions (Reys, *et al.* 2013). The context of sports helps students to express mathematical ideas that they already have, because they are more comfortable and confident (Sanchal & Sharma, 2017).

Nowadays, futsal is a popular sport among both male and female students. The futsal game is a fun activity for students that can be used as a context for the development of reading texts in School Literacy Movement. Futsal is a ball game that is played by five players that involves speed, and it is played in a room with a smaller size than a soccer field (Sturgess, 2017). From this explanation, it can be concluded that the connection between futsal and mathematics is that in futsal, it requires speed in the movement of players and balls. Speed is one of the mathematical material learned by students in school, so it can be said that there is a connection between mathematics and futsal. Futsal is a game with two teams; each of them consists of five people who have to put the ball into the opponent's goal by manipulating the ball with the foot (Lhaksana, 2011). In futsal, some players already can play futsal. In mathematics, a collection of objects that have properties with definitions are referred to as assets. Set is a collection of objects or objects that can be clearly defined (Walpole, 2010).

## METHOD

In this study, researchers used design research method with a development studies type (Akker, *et al.* 2006; Plomp & Nieveen, 2010). This development research is a type of research aimed at producing students' worksheet for School Literacy Movement in learning mathematics which held in 7<sup>th</sup> grade of junior high school. This study consists of three stages; the first one is the introductory stage, the prototyping stage, and the assessment stage (Plomp & Nieveen, 2010). In the prototyping stage, the evaluation flow using formative evaluation, the phases cover self-evaluation, expert review and one-to-one, and small group, as well as the field test. However, the previous stages are using the stages of assessment (Tessmer, 1993; Zulkardi, 2006; Permatasari, Putri, & Zulkardi, 2018).

Data collection and analysis techniques in this study include documentation, walkthroughs, questionnaires, observation sheets, interviews, and tests. The purpose of the walkthrough is to collect suggestions and comments from expert reviews for the validation of the first prototype. The walkthrough stage was done at the time of validation to the expert review. Documentation was done to

collect the results of comments/suggestions from the validator, comments/suggestions from students, the results of the answers from the students, and the photographs of the research. Documentation was done during the one-to-one, small group, and field test stages. Interviews were conducted during one-to-one, small group, and field tests. Questionnaires are given when small groups and field tests were conducted. The observation sheet and test are used in the text field. The results of the walkthrough, documentation, observation sheets, and interviews were analyzed qualitatively.

Meanwhile, questionnaires and tests were conducted to see the potential effects of the prototypes produced on learning outcomes. The potential effects of this study can be seen from the percentage of questionnaires and improvement from student learning outcomes before and after the worksheets are given to *Gerakan Literasi Sekolah* in mathematics learning. This research uses the formula for calculating normalized gain and interpretation from Meltzer (2002).

## RESULT AND DISCUSSION

Research has produced a valid and practical worksheet for School Literacy Movement and has a potential effect on student learning outcomes in a complete material. The procedure used in this research is the introductory stage, the prototyping stage, and the assessment stage. In the prototyping stage, the evaluation flow is using formative evaluation; the phase is cover self-evaluation, expert review, one-to-one, and small group, as well as the field test. At the introductory stage, the researcher analyzes the assembling of School Literacy Movement in Junior High School, the ability of students in mathematics learning and the interest of students in futsal games. Also, the researcher is also analyzing the aspects of futsal competition that have relevance to the mathematics material of 7<sup>th</sup>-grade student in Junior High School based on the curriculum 2013. The results have been published in the 2018 Ed-Humanistic journal.

In the stage of self-evaluation, the researchers conducted their assessment of the design of worksheets for School Literacy Movement, which had been developed in terms of content, constructs, and language. This worksheet contains reading texts with some questions that are by the stages in the School Literacy Movement and especially at the learning stage adjusted to the *Kurikulum 2013* for junior high school. Researchers make the prototype, and expert reviews and students will validate that at the one to one stage.

In the prototyping stage, the 1<sup>st</sup> prototype was validated by the experts and colleagues, then tested at the one to one stage and then to the small group stage to see the validity and practicality of the worksheets that had been developed. The validity of the worksheet can be seen from the expert review comments/suggestions based on the suitability of the reading text and the questions presented on the worksheet according to the content, constructs, and language. In the expert review stage, the researcher asked the opinion of experts and colleagues who had experience in mathematics education, futsal games, and school literacy movement. The expert is the lecturers in the doctoral program in mathematics education at the University of Education in Indonesia, lecturers in sports education as well as futsal coaches at the University of Education in Indonesia, and also teachers of mathematics course who attended School Literacy Movement's training.

Along with the implementation of the Expert Review stage, one to one stage is also carried out. The 1<sup>st</sup> Prototype was tested on three students who were not the subject of research, namely three students in 7<sup>th</sup> grade from one of the junior high schools in Karawang. The purpose of the implementation of this trial is to find out the responses and difficulties faced by students when reading and answering questions in the text. The responses and difficulties observed focused on the readability and clarity of the text, along with the questions in the text. The reading text in this study was compiled for the School Literacy Movement, which consisted of habituation, development, and learning stages. After the trial, the researcher allows students to give comments and suggestions regarding the School Literacy Movement's reading texts. The results from the Expert Review and one to one stages show that the reading text on the worksheet for School Literacy Movement is valid (Effendi, *et al.* 2018).

The 1<sup>st</sup> Prototype which has been revised in the Expert Review and One to One stages is considered as the 2<sup>nd</sup> prototype, which will then be tested in the small group stage, consists of 12 students from 7<sup>th</sup> grade from one of the junior high schools in Karawang which is not the subject of research. The purpose of this small group stage is to see the practicality of the product that has been made. Besides documentation and interview stage, researchers also used a questionnaire to see the practicality of the reading text of the School Literacy Movement in learning mathematics. Practically refers to the extent that user (or other experts) consider the intervention as appealing and usable in normal conditions (Akker, 1999). In the development of worksheets for the School Literacy Movement, practicality is shown by the attraction/liking, usability, and convenience for students. Based on the results of the questionnaire, the percentage aspect of attraction was 79%, the usability aspect was 92%, and the facilitation aspect was 81%. Practicality is seen as the main quality because when something is impractical, it won't last long, no matter how valid, and reliable it is (Jin, 2018). Practical products will make users comfortable when they are using it; that's why the product can last a long time.

The field test stage is the final stage informative evaluation of the development of worksheets for the School Literacy Movement in mathematics learning. After obtaining a valid and practical third prototype, a field test is then carried out. In this field test stage, the research subjects were a 7<sup>th</sup>-grade student from one of the Junior High Schools in Karawang with a total of 38 students. This field test was divided into four steps, the first stage was using worksheets for habituation phase of School Literacy Movement, the second stage was using worksheets for the development stage of School Literacy Movement, the third stage was using worksheets for learning stage of School Literacy Movement, and the fourth stage is the provision of test results. The purpose of the worksheet test for School Literacy Movement by giving these test questions is to see the potential effects on student learning outcomes.

The worksheets for School Literacy Movement at the habituation stage consist of three texts with the title of *Sejarah Futsal Dunia* (The world history of Futsal), *Sejarah Futsal di Indonesia* (The history of Futsal in Indonesia), and *Prestasi Tim Nasional Futsal Indonesia* (The achievement of the Indonesian Futsal National Team) with questions at the end of the text. At this stage, students are able to understand the reading text and answer questions that are suitable for the purpose of the habituation stage, which is to increase the

willingness to read outside of school hours, improve reading comprehension, improve self-confidence as a good reader, develop the use of various reading sources (Retnaningdyah, 2016). In the answer, it can be seen that students like the text they read, there are no difficult words, and students have been able to retell the contents of the text they have read. The results of student's answer are shown in Figure 1.

1. Apakah kamu menyukai teks Prestasi Tim Nasional Futsal Indonesia? berikan alasannya!

Suka, karena tim futsal Indonesia sejak menjadi Asia Tenggara pada tahun 2010 selalu menunjukkan perkembangan signifikan

2. Apakah ada istilah atau kata-kata yang tidak kamu mengerti? sebutkan jika ada!

Tidak Ada

3. Ceritakan kembali dengan bahasamu teks Prestasi Tim Nasional Futsal Indonesia yang telah kamu baca!

Dimulai dari itu muncul pemain-pemain berbakat yg siap untuk mengharumkan nama tanah air kita yaitu tim nasional futsal yg berada di bawah naungan PSSI sebagai induk organisasi di Indonesia. Meskipun begitu, tim yg berjudul "Pasukan Garuda" prestasi yang diraih tim nasional futsal putri tidak kalah gemilang dengan tim futsal putra meski perkembangannya tidak pesat seperti tim futsal putra. Sejalan dengan meraih medali perunggu

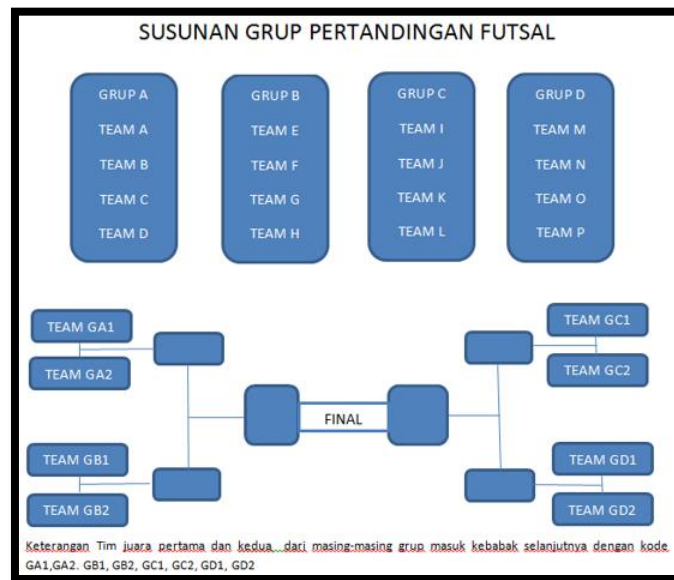
**Figure 1.** Student's Answer

The worksheets for School Literacy Movement at the development stage consist of five texts and the titles are *Lapangan dan Bola Permainan Futsal* (field and ball for Futsal Game), *Teknik Dasar Permainan Futsal* (the fundamental technic in Futsal game), *Strategi Permainan Futsal* (The strategic of Futsal Game), *Sanksi dalam Permainan Futsal* (the punishment of Futsal Game), and *Sistem Pertandingan Futsal* (The system of Futsal). At this stage, students are expected to be able to see the relevance of the text they read with mathematical material. The activities in this phase cover when students read the text and answer the questions in the text compiled based on the objectives of the development stages of School Literacy Movement, one of them is the students find the connection between books that are read by themselves and their surroundings (Retnaningdyah, 2016). In the text entitled the *Sistem Pertandingan Futsal*, the information is provided regarding the match system used by amateur and professional classes, at the district, national and even international levels. The text explained the match system on futsal games that are divided into two systems, such as the knockout system and the competition system starting from understanding, scoring rules to sample charts of match systems. Figure 2 shows that the reading text section is presented regarding scoring for the competition match system.

Penentu kemenangan pada sistem kompetisi adalah jumlah poin yang diperoleh diakhir kompetisi. Poin nol (0) untuk peserta yang kalah poin tiga (3) untuk peserta yang menang, dan poin satu untuk kedua peserta yang seri.

**Figure 2.** Scoring Information

Furthermore, the example of a competition system match chart shown in Figure 3.



**Figure 3.** Example of a Competition System Match Chart

From “*Sistem Pertandingan Futsal*” text, students express their idea about benefits that they achieve and the word difficulties that they find on the text, also the connection between mathematics material and the text that can be seen at Figure 4. Students express that the text has a connection with sets and addition in integer’s material. Students also write the part of futsal that has a connection with the material that is team division and scoring rules in the futsal competition system.

- Apakah teks Sistem permainan futsal tersebut bermanfaat untuk kamu?  
Mengetahui sistem dan syaratnya.
- Apakah ada istilah atau kata-kata yang tidak kamu mengerti? sebutkan jika ada!  
Tidak ada
- Apakah yang ingin dipelajari setelah anda membaca teks tersebut?  
Sistem permainan futsal
- Adakah materi matematika yang bisa kamu pelajari dari teks tersebut? sebutkan jika ada  
Himpunan seperti Grup A, B, C dan D dan penjumlahan
- Pembahasan bagian yang mana pada teks diatas yang berkaitan dengan materi matematika?  
Susunan Grup Pertandingan Futsal, Poin sistem kompetisi

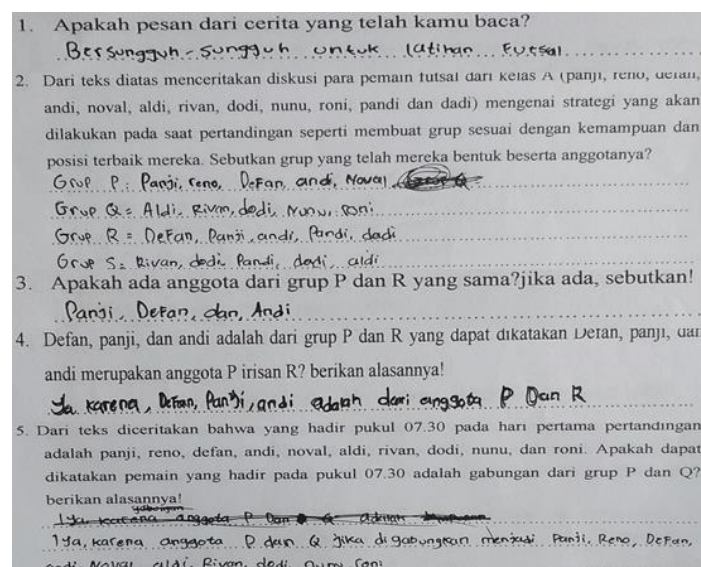
**Figure 4.** Students’ Answer

The worksheets for School Literacy Movement at the learning stage consist of five texts, and the title is *Harumkan Nama Kampus dengan Modal Kebersamaan* (Promote your campus with togetherness). The text on this stage is developed by sets material. The text is divided into five parts, and the questions are adjusted to sets sub-materials, that are set and universal set concept, empty set, and subset, sets on Venn diagram, intersection, and union of sets, difference and complement of sets.



The questions on the text are arranged based on the purpose of the learning stage that is to develop the ability to understand the text and relate it to personal experience so they will become the lifelong learners, develop their critical thinking skills, and process and manage their communication skills creatively through responding to textbooks and learning books (Retnaningdyah, 2016).

Figure 5 shows the students' answers to the text relating to the intersection and the union of sets. From the answers of the students, it was seen that students were able to understand the initial knowledge about the intersection and the union of sets. It is starting from students could write groups formed on futsal team A and its members, determine the same members in group P and group R, and determine the set's intersection from groups P and R accompanied by the reasons. Next, determining the group P and group Q that are present at the same time is a union of sets and accompanied by the reasons. Reading the text in futsal context is one of the students' daily lives and the questions that guide students can make it easier for students to understand mathematical material. Stacey (2011) said that context plays an important role in learning and assessment, because students are prepared to welcome the challenges of the future, so it needs to be introduced to various contexts that cover various aspects of their lives.



**Figure 5.** Students' Answer

After the activities of the literacy movement in the habituation stage, the development, and the learning at the field test stage has been completed; the researcher gives a test on the set material because it is by the material at the learning stage. Tests at the field test stage and giving these test questions are to see the potential effects on student learning outcomes. The test questions consist of three questions with the cognitive level of application (L2) for questions number 1 and number 3 and the cognitive level of reasoning (L3) for question number 2. The level of this question is adjusted to the cognitive level in the guidelines from national standard school exam questions (Kemendikbud, 2018). Tests were given before and after the implementation of the school literacy movement in the learning phase. From the results of the pretest and posttest, it can be seen that there is an improvement in the score of students' tests. Based on the calculation of normalized gain, it shows that the average increase is 0.37, and the



interpretation is middle. From the 38 students, there were 38.8% of students who the improvement in test results were low, 55.2% of students had a middle improvement in the test results and 0.08% of students who had a high improvement in the test results. The low of students who have high improvement is because students are still not accustomed to understanding mathematical materials from the verbal language, so students have difficulty writing their arguments in response to the questions given. The students' arguments show their mindset. The important role of mathematical argumentation is one of the goals in developing students' abilities that are by the talents of students (Inglis, Mejia-Ramos, & Simpson, 2007; Soekisno, 2015; Sukirwan, *et al.* 2018).

Based on the results of the questionnaire, it shows that the text and questions in the futsal context presented on the worksheet for the School Literacy Movement have a potential effect on mathematics learning. An important aspect ineffectiveness (potential effects) of an instrument, theory, or model is knowing the level/degree of application of the theory, or model in a particular situation (Reigeluth, 1999). Akker (1999) said that the effectiveness of developing instruments, models, theory in education refers to the consistencies of experience and results of interventions with the intended purpose. The relationship between results and objectives shows potential effects. In this case, the potential effects of the use of reading texts on worksheets for School Literacy Movements can be seen from the results obtained from both the answers to questions in the text and the test questions given at the end of learning activities with expected goals based on the School Literacy Movement program.

Based on the results of the questionnaire, that used to see the potential effects of worksheets for the School Literacy Movement, the 93.8% of the achievement at the habituation stage was shown by students who liked the texts they read, and the texts that were read were not boring. So, they were able to answer questions at the habituation stage because the text presented is clear and easy for them to understand. The 76.3% of the achievement at the development stage was shown by students who stated that they were helped to understand the connection between mathematical material and futsal games. After reading the texts and the questions, it provided could help students to see the connection between the texts presented with mathematics so that students could understand the relevance of the text presented with mathematical material. The 75.4% of the achievement at the learning stage was shown by students who stated that beginning mathematics learning with reading and providing the easily understandable questions could help students to understand the mathematics materials being studied, so it affects students' understanding in mathematics learning. Thus, learning that begins with the activity of reading texts related to mathematical material makes students more interested in learning and the students' literacy skills is better because the presented context is interesting to them and learning becomes more varied.

## CONCLUSION

The products are the worksheets that consist of the texts and the questions that are by the stages of School Literacy Movement. There are three texts for the habituation stage regarding the history of

futsal games, five texts for the development stage regarding various rules for futsal games, and five texts for the learning stage with the title *Harumkan Nama Kampus dengan Modal Kebersamaan*. The reading texts and questions on worksheets for School Literacy Movement are valid and practical. The validators' assessment shows valid in terms of content, constructs, and language. Practicality is showed by the results of the trials in the small group stage, namely worksheets for the School Literacy Movement that contain all three aspects of practicality, namely easiness, usability, and attraction. The worksheets for the School Literacy Movement have a potential effect on the learning outcomes of the 1<sup>st</sup>-grade high school students in Karawang. It can be seen from the percentage of the increase in test scores that are 38.8% of students are low, 55.2% of students are middle, and 0.08% of students are high. Also, the results of the questionnaire show that the achievement of the habituation stage is 93.8%, the development stage is 76.3%, and the learning stage is 75.4%. After carrying out this research, the researchers suggest that students used to read various non-learning books directed by the teacher to understand the connection of mathematical material to students' daily lives, so they can understand and resolve contextual problems and provide arguments for resolving these contextual problems, and they also will improve their literacy skills.

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